

Modified Form PTO-1390 (11-98)

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

ATTORNEY'S DOCKET NUMBER
USPL-77

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)
10/069695

INTERNATIONAL APPLICATION NO.
PCT/US00/23124

INTERNATIONAL FILING DATE
23 August 2000 (23.08.00)

PRIORITY DATE CLAIMED
24 August 1999 (24.08.99)

TITLE OF INVENTION SCREEN FOR REAR PROJECTION DISPLAY

APPLICANT(S) FOR DO/EO/US Roy Auerbach, Joachim Bunkenburg, Brahim Dahmani, E. Gregory Fulkerson, Simon Magarill,
and John D. Rudolph

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☒ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
(see Express Mail Information)

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 10/069695		INTERNATIONAL APPLICATION NO. PCT/US00/23124		ATTORNEY'S DOCKET NUMBER USPL-77	
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<p>17. <input checked="" type="checkbox"/> The following fees are submitted:</p> <p>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1)-(5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1,040.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2) paid to USPTO \$740.00</p> <p>International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00</p> <p>International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00</p> <p style="text-align: right;">ENTER APPROPRIATE BASIC FEE AMOUNT =</p> <p>Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%;">CLAIMS</th> <th style="width: 20%;">NUMBER FILED</th> <th style="width: 20%;">NUMBER EXTRA</th> <th style="width: 20%;">RATE</th> <th style="width: 20%;"></th> </tr> <tr> <td>Total claims</td> <td>14 - 20 =</td> <td>0</td> <td>X \$18.00</td> <td>\$</td> </tr> <tr> <td>Independent claims</td> <td>1 - 3 =</td> <td>0</td> <td>X \$84.00</td> <td>\$</td> </tr> <tr> <td colspan="3">MULTIPLE DEPENDENT CLAIM(S) (if applicable)</td> <td>+ \$280.00</td> <td>\$</td> </tr> <tr> <td colspan="4" style="text-align: right;">TOTAL OF ABOVE CALCULATIONS =</td> <td>\$ 710.00</td> </tr> </table> <p>Reduction by 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).</p> <p style="text-align: right;">SUBTOTAL =</p> <p>Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).</p> <p style="text-align: right;">TOTAL NATIONAL FEE =</p> <p>Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +</p> <p style="text-align: right;">TOTAL FEES ENCLOSED =</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;"></td> <td style="width: 20%; text-align: right;">Amount to be:</td> <td style="width: 20%; text-align: center;">\$</td> </tr> <tr> <td></td> <td style="text-align: right;">refunded</td> <td></td> </tr> <tr> <td></td> <td style="text-align: right;">charged</td> <td style="text-align: center;">\$</td> </tr> </table>	CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		Total claims	14 - 20 =	0	X \$18.00	\$	Independent claims	1 - 3 =	0	X \$84.00	\$	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$280.00	\$	TOTAL OF ABOVE CALCULATIONS =				\$ 710.00		Amount to be:	\$		refunded			charged	\$	<p style="text-align: center;">CALCULATIONS PTO USE ONLY</p>
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	charged	\$																																	

a. ☒ A check in the amount of \$ 710.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 11-1158 in the amount of \$_____ to cover the above fees.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required by this paper, or credit any
overpayment to Deposit Account No. 11-1158. A duplicate copy of this sheet is enclosed

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

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Maurice M. Klee, Ph.D.
 Registration Number. 30,399

2/21/02

Date

[222] Attorney Docket No. :USPL-77

PCT

IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)

International Appl. No. : PCT/US00/23124
International Filing Date : 23 August 2000 (23.08.00)
Priority Date Claimed : 24 August 1999 (24.08.99)
Title of Invention : SCREEN FOR REAR PROJECTION DISPLAY
U.S. Serial No. : Not Yet Assigned
Applicant (U.S.) : Roy Auerbach, Joachim Bunkenburg,
Brahim Dahmani, E. Gregory Fulkerson,
Simon Magarill, and John D. Rudolph

BOX PCT
COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, D.C. 20231
ATTENTION: DO/EO/US

PRELIMINARY AMENDMENT

Prior to its initial examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

Please insert the following before the first line of the specification:

CROSS REFERENCE TO RELATED APPLICATIONS

This application is the U.S. national phase under 35 USC §371 of International Application No. PCT/US00/23124, filed August 23, 2000, which was published in English under PCT Article 21(2) on March 1, 2001 as International Publication No. WO 01/14927. This application claims the benefit under 35 USC §119(e) of U.S. Provisional Application No. 60/150,451 filed August 24, 1999, the contents of which in its entirety is hereby incorporated by reference.

Respectfully submitted,

Date: 2/21/02

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[222] Attorney Docket No. :USPL-77

PCT

IN THE UNITED STATES DESIGNATED/ELECTED OFFICE
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International Appl. No. : PCT/US00/23124
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Applicant (U.S.) : Roy Auerbach, Joachim Bunkenburg,
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WASHINGTON, D.C. 20231
ATTENTION: DO/EO/US

LETTER

Attached hereto as Exhibit A is a copy of replacement page 7 which was filed under Rule 34 during the Chapter II international prosecution of this application.

Applicants assume that the examination of this application will be based on the claims which appear on this replacement sheet. If this assumption is incorrect, applicants request that this letter be considered as a **Preliminary Amendment** substituting these claims for the originally filed claims of the above-identified PCT application.

In general terms, the differences between the claims which appear on the replacement sheet and applicants' original claims are as follows:

Claim 1 -- amended

Claims 2-7 -- unchanged

Specifically, Claim 1 appears as follows on the replacement sheet:

-2-

1. (amended) A rear projection screen for use with a projection lens which has an exit pupil, said screen having a light entering side and a light exiting side and comprising in order from said light entering side to said light exiting side:

- (a) a Fresnel structure;
- (b) a lenslet array; and
- (c) an opaque layer comprising a plurality of holes, said holes being at locations which correspond to the images of the exit pupil formed by the combination of the Fresnel structure and the lenslet array.

A copy of original Claim 1 annotated to show the differences between the original claim and the replacement claim is attached as Exhibit B.

REMARKS

The above amendment changes the word "pinholes" to the word --holes-- in applicants' Claim 1. Support for this amendment can be found at, for example, page 5, line 3, of applicants' specification.

Examination of this application based on the amended claims is respectfully requested.

Respectfully submitted,

Date: 2/21/02

Maurice Klee
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Attorney for Applicant
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Exhibit B
Annotated Copy of Claim 1

1. (amended) A rear projection screen for use with a projection lens which has an exit pupil, said screen having a light entering side and a light exiting side and comprising in order from said light entering side to said light exiting side: -

- (a) a Fresnel structure;
- (b) a lenslet array; and
- (c) an opaque layer comprising a plurality of [pinholes] holes, said holes [pinholes] being at locations which correspond to the images of the exit pupil formed by the combination of the Fresnel structure and the lenslet array.

5

SCREEN FOR REAR PROJECTION DISPLAY

I. FIELD OF INVENTION

This invention relates to rear screen projection systems including
 10 CRT, LCD, and DLP displays, as well as slide projectors.

II. BACKGROUND OF THE INVENTION

A projection screen is an optical device which does not create an
 image but provides a required field of view in the vertical and horizontal
 directions of viewer space. By reducing the field of view in the vertical
 15 direction, the screen creates the effect of increasing the brightness of the
 image within the viewing area, an effect which is referred to in the art as
 gain.

III. SUMMARY OF THE INVENTION

The invention provides a new structure for a compound screen for a
 20 rear projection display. More particularly, the invention provides a rear
 projection screen for use with a projection lens which has an exit pupil (23
 in Figure 3), said screen having a light entering side and a light exiting side
 and comprising in order from said light entering side to said light exiting
 side:

- 25 (a) a Fresnel structure (11 in Figure 1);
- (b) a lenslet array (13 in Figure 1); and
- (c) an opaque layer (15 in Figure 1) comprising a plurality of
 pinholes, said pinholes being at locations which correspond to the images of
 the exit pupil formed by the combination of the Fresnel structure and the
 30 lenslet array.

The lenslet array can comprise elements which have a square aperture in which case, in viewer space, the screen's half field of view α can be described by the equation:

$$\alpha = \tan^{-1}(0.5 \cdot CA/f)$$

- 5 where CA and f are, respectively, the clear aperture and the focal length of the elements.

Alternatively, the lenslet array can comprise elements which have a rectangular aperture in which case the screen's vertical half field of view α_v and horizontal half field of view α_H , in viewer space, can be described by the equations:

$$\alpha_v = \tan^{-1}(0.5 \cdot CA_v/f)$$

and

$$\alpha_H = \tan^{-1}(0.5 \cdot CA_H/f)$$

- where CA_v , CA_H , and f are, respectively, the vertical clear aperture, the horizontal clear aperture, and the focal length of the elements.

As a further alternative, the lenslet array can comprise anamorphic elements in which case the screen's vertical half field of view α_v and horizontal half field of view α_H , in viewer space, can be described by the equations:

$$20 \quad \alpha_v = \tan^{-1}(0.5 \cdot CA/f_v)$$

and

$$\alpha_H = \tan^{-1}(0.5 \cdot CA/f_H)$$

where CA, f_v , and f_H are, respectively, the clear aperture, the vertical focal length, and the horizontal focal length of the elements.

- 25 The screen can comprise a protective layer on the light exiting side of the opaque layer. The Fresnel structure, the lenslet array, the opaque layer, and the protective layer can be arranged as subassemblies, e.g., the Fresnel structure and the lenslet array can be arranged in one subassembly and the opaque layer and the protective layer can be arranged in another subassembly.
- 30

When the screen is used with a pixelized panel, the lenslet array can comprise elements whose size is at least several times smaller than the magnified image of a pixel produced at the array by the projection lens. Similarly, when the screen is used with a cathode ray tube, the lenslet array can comprise elements whose size is at least several times smaller than the magnified image of a dot spot of the cathode ray tube produced at the array by the projection lens.

The accompanying drawings, which are incorporated in and constitute part of the specification, illustrate the various aspects of the invention, and together with the description, serve to explain the principles of the invention. It is to be understood, of course, that both the drawings and the description are explanatory only and are not restrictive of the invention.

IV. BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic drawing of a rear projection screen constructed in accordance with the invention.

Figure 2 is a schematic drawing illustrating the correlation between the size of a lenslet array element and the projected image of a single pixel.

Figure 3 is a conceptual ray tracing for the rear projection screen of Figure 1.

Figure 4 is a schematic drawing illustrating lenslet array elements having a rectangular aperture.

The reference numbers used in the drawings refer to the following:

- 11 Fresnel structure
- 13 lenslet array
- 15 opaque layer with pinholes
- 17 smooth surface of protective layer
- 19 elements of lenslet array
- 21 magnified image of single pixel
- 23 exit pupil of projection lens
- 25 light from projection lens

27 parallel beam

29 light in viewer space

V. DESCRIPTION OF THE INVENTION

The structure of a screen constructed in accordance with the
5 invention is shown in Figure 1.

As shown in this figure, the compound screen has four elements
which are: (1) Fresnel structure 11; (2) lenslet array 13; (3) opaque layer 15
with two dimensional structure of precision pinholes; and (4) a protective
layer having a smooth outer surface 17. These elements can be arranged in
10 two components as shown in Figure 1, where one component is a substrate
with a Fresnel structure on one side and a lenslet array on the other and
the other component has an opaque layer with a pinhole structure on one
side and a smooth second side which serves as a protective layer.

The four elements listed above can be arranged in any combination of
15 subassemblies but must have the following order from the projection lens to
the viewer: Fresnel structure, lenslet array, and opaque layer with
pinholes. The protective layer may not be necessary for all applications or
may be unnecessary with the selection of a suitable opaque layer. When
used, the flat protective layer on the viewer side provides an easy way to
20 clean the screen with typical methods and products for cleaning. Also, this
layer adds abrasion and impact resistance to the screen.

Figure 2 shows a lenslet array where the shape of each element 19 of
the array has a square aperture to collect all light from the projection lens.
As illustrated in this figure, the size of each element 19 is much (at least
25 several times) smaller than the magnified image 21 of a projected pixel of a
LCD/DLP or the dot spot of a CRT. This provides elimination of moiré
effects on the screen.

The work of the screen is illustrated in Figure 3. Light 25 from the
exit pupil 23 of the projection lens illuminates the Fresnel structure which
30 has a front focal distance equal to the distance from the exit pupil of the
projection lens to the screen. This means that after refraction on the

Fresnel structure, the light becomes parallel to the optical axis as shown at 27. Each element of the lenslet array focuses the light in its back focal plane. Light then passes through the holes in the opaque layer and exits into the viewer space as shown at 29.

5 The field of view in the viewer space can be calculated as:

$$\tan(\alpha) = \frac{0.5 \times CA}{f'}$$

where α is the half of field of view (angular dimension), CA is the clear aperture (optical diameter) of a single element of the lenslet array, and f' is the focal distance of the element.

10 To provide a different field of view in the vertical and horizontal directions two different solution can be implemented:

(1) Each element of the lenslet array can have a rectangular aperture as shown in Figure 4. In this case the vertical and horizontal fields of view can be determined as:

15
$$\tan(\alpha_v) = \frac{0.5 \times CA_v}{f'}, \tan(\alpha_H) = \frac{0.5 \times CA_H}{f'}$$

where α_v and α_H are the half angular fields of view in the vertical and horizontal directions, respectively, and CA_v and CA_H are the clear aperture of the element in these directions.

(2) Each element of the lenslet array can have a toroidal shape to
20 provide different focal lengths in the vertical and horizontal directions (anamorphic property). For this case the equations for the vertical and horizontal fields of view are:

$$\tan(\alpha_v) = \frac{0.5 \times CA}{f'_v}, \tan(\alpha_H) = \frac{0.5 \times CA}{f'_H}$$

where f'_v and f'_H are the focal lengths of the element in the vertical and
25 horizontal directions.

The opaque layer with the sets of pinholes can be done out of photoresist material. This material is exposed with an electromagnetic field

and developed with an appropriate chemical process. The process of exposure is done after both components of the screen are assembled. The source of the electromagnetic field is located at the position of the exit pupil of the projection lens (see Figure 3). This provides automatic compensation of all inaccuracies in the lenslet array with an appropriate shape and location of the pinholes in the developed opaque layer.

To increase the contrast and reduce the reflection of ambient light in the viewer space the opaque layer can be further improved by the addition of materials which increases the absorption of this layer. All air contact surfaces of the screen can have antireflection coatings that reduce the reflectivity and increase the contrast.

By using identical materials or materials with appropriate thermal coefficients of expansion, the optical properties of the screen can be maintained throughout the temperature and humidity variations which can be expected from seasonal climate conditions and set operation.

From the foregoing, it can be seen that the benefits of the screen design of the invention include:

- elimination of moiré effect;
- full control of vertical and horizontal field of view in viewer space;
- low loss for light propagation from the projection lens to the viewer space and high loss of light (opaque property) in reverse direction; and
- a protective layer on the outside side of the screen.

Although specific embodiments of the invention have been described and illustrated, it will be apparent to those skilled in the art that modifications and variations can be made without departing from the invention's spirit and scope. The following claims are thus intended to cover the specific embodiments set forth herein as well as such modifications, variations, and equivalents.

What is claimed is:

1. A rear projection screen for use with a projection lens which has an exit pupil, said screen having a light entering side and a light exiting side and comprising in order from said light entering side to said light exiting side:

- (a) a Fresnel structure;
- (b) a lenslet array; and
- (c) an opaque layer comprising a plurality of holes, said holes being at locations which correspond to the images of the exit pupil formed by the combination of the Fresnel structure and the lenslet array.

2. The screen of Claim 1 wherein the lenslet array comprises elements which have a square aperture.

3. The screen of Claim 2 wherein, in viewer space, the screen has a half field of view α given by:

$$\alpha = \tan^{-1}(0.5 \cdot CA/f)$$

where CA and f are, respectively, the clear aperture and the focal length of the elements.

4. The screen of Claim 1 wherein the lenslet array comprises elements which have a rectangular aperture.

5. The screen of Claim 4 wherein, in viewer space, the screen has a vertical half field of view α_v given by:

$$\alpha_v = \tan^{-1}(0.5 \cdot CA_v/f)$$

and a horizontal half field of view α_h given by:

$$\alpha_h = \tan^{-1}(0.5 \cdot CA_h/f)$$

where CA_v , CA_h , and f are, respectively, the vertical clear aperture, the horizontal clear aperture, and the focal length of the elements.

6. The screen of Claim 1 wherein the lenslet array comprises anamorphic elements.

7. The screen of Claim 6 wherein, in viewer space, the screen has a vertical half field of view α_v given by:

$$\alpha_v = \tan^{-1}(0.5 \cdot CA/f_v)$$

and a horizontal half field of view α_H given by:

$$\alpha_H = \tan^{-1}(0.5 \cdot CA/f_H)$$

where CA , f_V , and f_H are, respectively, the clear aperture, the vertical focal length, and the horizontal focal length of the elements.

8. The screen of Claim 1 further comprising a protective layer on the light exiting side of the opaque layer.
9. The screen of Claim 8 wherein the Fresnel structure, the lenslet array, the opaque layer, and the protective layer are arranged as subassemblies.
10. The screen of Claim 9 wherein the Fresnel structure and the lenslet array are arranged in one subassembly and the opaque layer and the protective layer are arranged in another subassembly.
11. The screen of Claim 1 wherein the screen is for use with a pixelized panel and the lenslet array comprises elements whose size is at least several times smaller than the magnified image of a pixel produced at the array by the projection lens.
12. The screen of Claim 1 wherein the screen is for use with a cathode ray tube and the lenslet array comprises elements whose size is at least several times smaller than the magnified image of a dot spot of the cathode ray tube produced at the array by the projection lens.
13. A rear screen projection system comprising a projection lens having an exit pupil and the screen of Claim 1.
14. The rear screen projection system of Claim 13 wherein the Fresnel structure has a front focal distance and the distance from the exit pupil of the projection lens to the screen is equal to said front focal distance.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(30) Priority Data:
60/150,451 24 August 1999 (24.08.1999) US(71) Applicant (for all designated States except US): **U.S. PRECISION LENS INCORPORATED** [US/US]; 4000 McMann Road, Cincinnati, OH 45245 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **AUERBACH, Roy** [US/US]; 2500 Oak Ridge Drive, Cincinnati, OH 45237 (US). **BUNKENBURG, Joachim** [US/US]; 113 Lynaugh Road, Victor, NY 14564 (US). **DAHMANI, Brahim**[FR/FR]; 5 bis, rue Gabriel Péri, F-92120 Montrouge (FR). **FULKERSON, E., Gregory** [US/US]; 3725 Charterwood Court, Amelia, OH 45102 (US). **MAGARILL, Simon** [US/US]; 9836 Orchardclub Drive, Cincinnati, OH 45242 (US). **RUDOLPH, John, D.** [US/US]; 5815 Ropes Drive, Cincinnati, OH 45244 (US).(74) Agent: **KLEE, Maurice, M.**; Attorney at Law, 1951 Burr Street, Fairfield, CT 06430 (US).

(81) Designated States (national): CN, JP, KR, US.

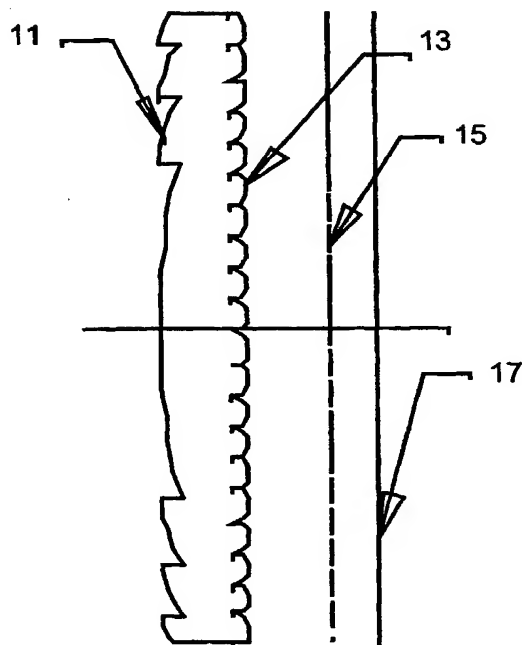
(84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SCREEN FOR REAR PROJECTION DISPLAY



(57) Abstract: A rear projection screen for use with a projection lens which has an exit pupil (23) is provided. The screen has a light entering side and a light exiting side and comprises in order from said light entering side to said light exiting side: (a) a Fresnel structure (11); (b) a lenslet array (13); and (c) an opaque layer (15) comprising a plurality of pinholes, said pinholes being at locations which correspond to the images of the exit pupil formed by the combination of the Fresnel structure and the lenslet array.

1/4

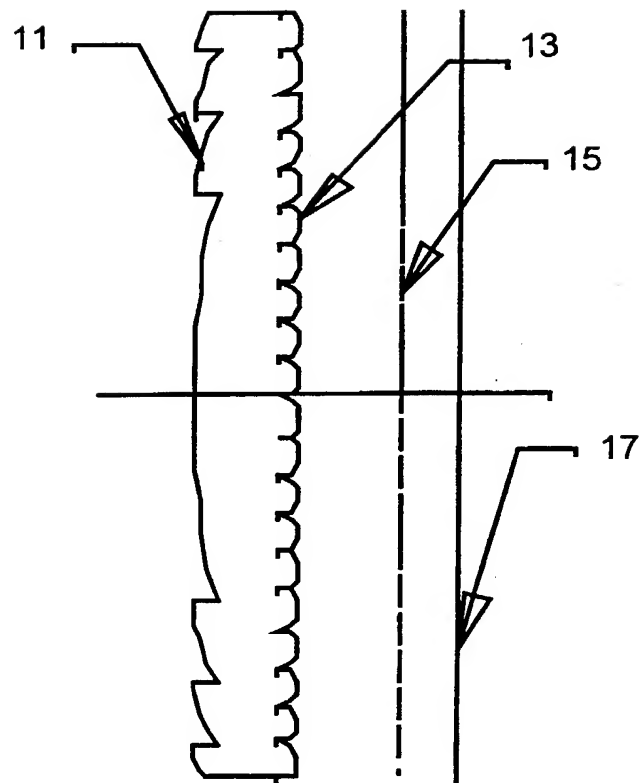


FIG. 1

2/4

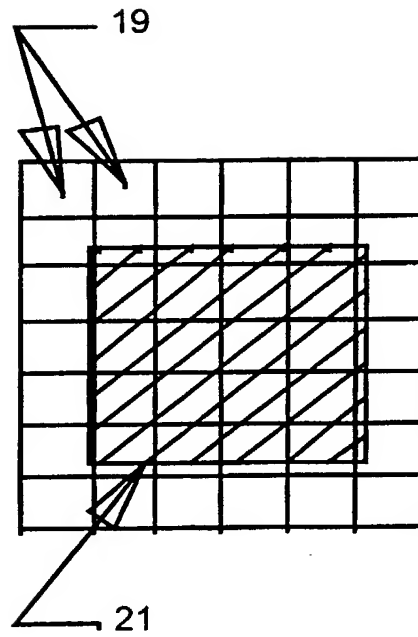


FIG. 2

3/4

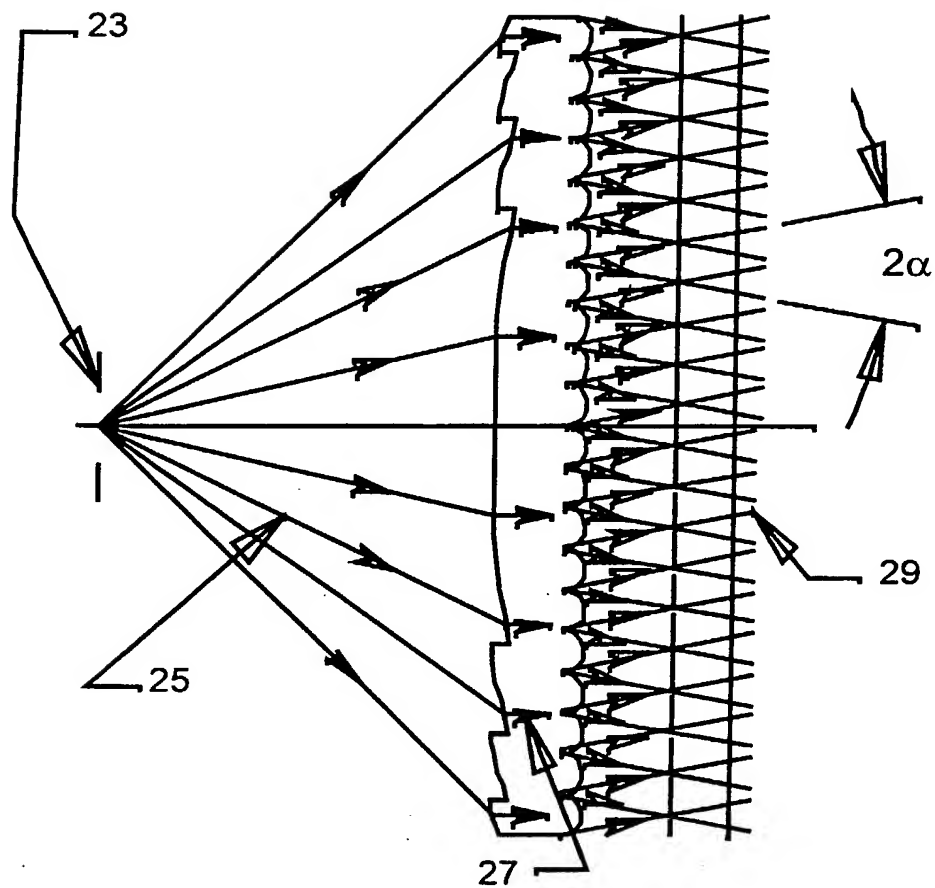


FIG. 3

4/4

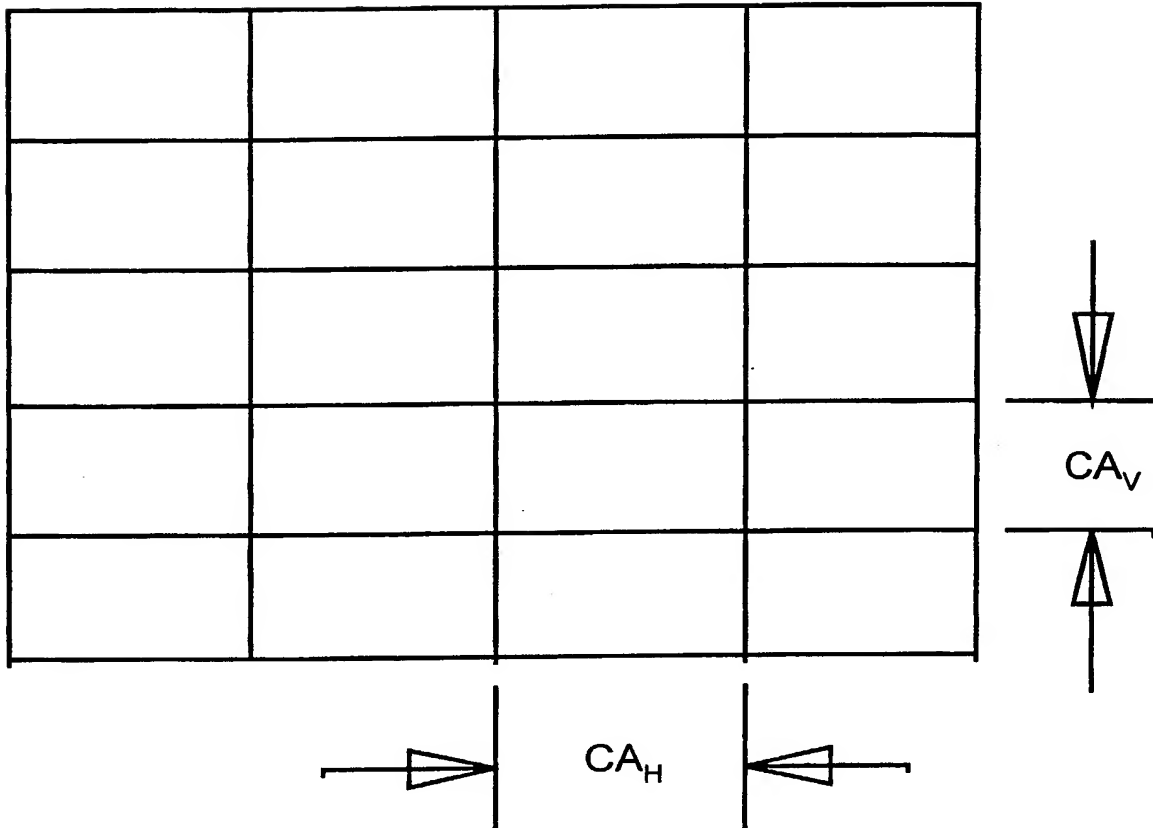


FIG. 4

**DECLARATION FOR UTILITY OR
DESIGN
PATENT APPLICATION
(37 CFR 1.63)**

☐ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16(e)) required)

Attorney Docket Number

USPL-77

First Named Inventor

Auerbach

COMPLETE IF KNOWN

Application Number

Filing Date

Group Art Unit

Examiner Name

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SCREEN FOR REAR PROJECTION DISPLAY

the specification of which

(Title of the Invention)

☐ is attached hereto
OR

☒ was filed on (MM/DD/YYYY) 08/23/2000 as United States Application Number or PCT International

Application Number PCT/US00/23124 and was amended on (MM/DD/YYYY) 03/16/2001 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
			<input type="checkbox"/>	YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.
60/150,451	08/24/1999	

DECLARATION - Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

☐ Customer Number

OR

☒ Registered practitioner(s) name/registration number listed below

Place Customer Number Bar Code Label here

Name	Registration Number	Name	Registration Number
Maurice M. Klee	30,399	Angela N. Nwaneri	34,229
Mark W. Lauroesch	35,583		
Alfred L. Michaelsen	24,511		

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number OR ☒ Correspondence address below

Name	Maurice M. Klee, Ph.D.				
Address	Attorney at Law				
Address	1951 Burr Street				
City	Fairfield	State	CT	ZIP	06430
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])		Family Name or Surname	
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Inventor's Signature	Date		May 16, 2002
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		ZIP	45237
		Country	US

☒ Additional inventors are being named on the 2 supplemental Additional Inventor(s) sheets PTO/SB/02A attached hereto.

DECLARATION

ADDITIONAL INVENTOR(S)

Supplemental Sheet

Page 1 of 2

Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
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Joachim					Bunkenburg				
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Post Office Address									
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DECLARATION

ADDITIONAL INVENTOR(S)

Supplemental Sheet

Page 2 of 2

Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
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Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
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Inventor's Signature						Date		5.15.02	
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Post Office Address									
City		Cincinnati		State OH		ZIP 45244		Country US	

Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
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Inventor's Signature						Date			
Residence: City				State		Country		Citizenship	
Post Office Address									
Post Office Address									
City				State		ZIP		Country	